BRITISH COLUMBIA
ENERGY POLICY

New Directions for the 1990s

- Efficient Energy
- Clean Energy
- Secure Energy
- Energy for the Economy

Province of British Columbia
Ministry of Energy, Mines
and Petroleum Resources

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Glossary of terms and units of measurement located on page 23.

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Efficient Energy: Cutting energy waste lowers consumer energy bills, benefits the environment, and makes British Columbia industry more competitive.

Secure Energy: Managing existing resources effectively, finding new sources of supply, increasing fuel choice for consumers, and maintaining the quality and quantity of energy supplies will ensure long-term energy security for the province.

Clean Energy: Shifting to cleaner fuels and reducing the environmental impacts of energy supply and use will help improve the quality of our air, water, and other natural resources.

Energy for the Economy: Developing energy resources across British Columbia will stimulate regional growth and bring economic benefits to the province as a whole.

BRITISH COLUMBIA
ENERGY POLICY

New Directions for the 1990s

- ▷ Introduction
- ▷ Efficient Energy
- ▷ Clean Energy
- ▷ Secure Energy
- ▷ Energy for the Economy
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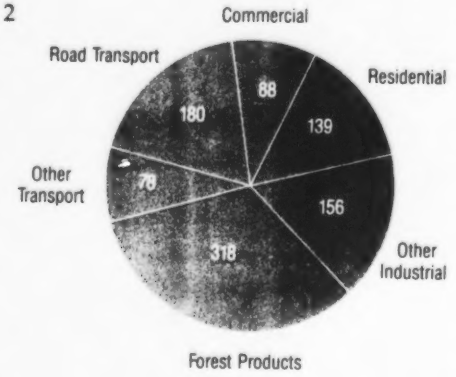
This document introduces some new directions for British Columbia's energy policy. Taken together, these new directions represent the most comprehensive statement of provincial energy policy since the Government produced its 1980 policy document, *An Energy Secure British Columbia*.

The energy scene in 1980 was dominated by supply uncertainties. British Columbia, like other industrial economies, had experienced the dramatic oil price shocks and supply shortages of the 1970s. There was widespread concern about continuing political instability in oil-producing countries of the Middle East. Energy policy in 1980 therefore focussed on managing energy resources to ensure security of supply, reducing imported oil consumption, and increasing provincial energy sources.

After 1980, conditions changed markedly. A world recession lowered energy use and relieved fears of shortages. Energy prices stabilized, in part because of the recession. This economic downturn was then followed by several years of steady growth.

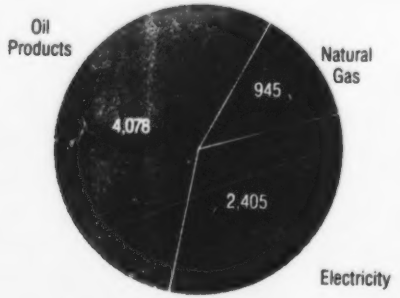
At the same time, a consensus developed in British Columbia, as elsewhere, against government intervention in markets and in favour of the determination of energy prices by market forces. Towards the end of

Lion's Gate Bridge —
Vancouver, British Columbia



Total Energy Use: 959 petajoules, 1989

Industry accounts for one-half of B.C.'s energy use



Total: $7,428 million, 1989

Over half of B.C.'s $7.4 billion annual energy bill goes for oil products

the 1980s, deregulation and increased competition were opening up new sources of provincial supply, enlarging British Columbia's abundant energy resources.

The beginning of the 1990s has brought the emerging priorities of energy efficiency and environmental protection. The Government of British Columbia is reshaping its energy policies to balance these new concerns with the need to ensure sustainable and economic energy supplies. In energy, as in other aspects of economic growth, the notion of sustainable development has been embraced as a guiding principle.

Yet with the renewal of instability in the Middle East, the 1990s are quickly showing that oil supplies can still be disrupted. Therefore energy security remains a key policy objective in British Columbia.

The Government has identified four central and inter-related themes for energy policy in the 1990s. The first two themes, **Efficient Energy** and **Clean Energy**, reflect our new

Government and energy

While B.C.'s energy policy is market-oriented, there is an ongoing role for government to see that our resources are developed and used wisely, for example by:

- promoting cost-effective energy efficiency and supply technologies, through information and education programs;
- ensuring, through utility regulation, that consumers have access to adequate supplies of energy at competitive prices;
- encouraging competition in supply, to keep costs down and improve energy security;
- protecting the natural environment and human health, and ensuring that pollution and other environmental impacts of energy are minimized;
- assisting in the development of energy infrastructure (e.g., pipelines) to increase security; and
- guaranteeing, through provincial royalties and taxes, that British Columbians receive their fair share of energy resource revenue.

Getting energy to market

Both the private and public sectors contribute to B.C.'s energy supplies. Oil, natural gas, and forest wastes are developed by the private sector. Eighty percent of our electricity is produced by B.C. Hydro, a Crown Corporation, with the remainder generated by private companies.

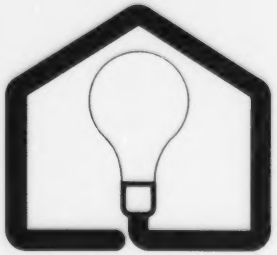
Oil: B.C. supplies only 20 percent of its oil needs — from reservoirs located in the northeast region of the province. Our main source of supply is Alberta, and small quantities are imported from the United States. Trans Mountain Pipe Line operates the main transmission line bringing Alberta and B.C. crude oil and products to Vancouver-area refineries.

Natural Gas: Gas is also produced in northeast British Columbia. Production exceeds domestic needs by 50 percent; the surplus is sold in the U.S. Pacific Northwest, California, and eastern Canadian and U.S. markets. Gas is brought to market by Westcoast Energy's transmission pipeline. BC Gas, Pacific Northern Gas, and ICG Utilities operate the province's main gas distribution systems, supplying over 600,000 customers.

Electricity: B.C. Hydro and West Kootenay Power are the two major electric utilities in the province. Industrial producers such as Alcan, Cominco, and pulp mills generate electricity for their own use and sell some surplus power to others.

Forest Wastes: The forest industry produces bark, sawdust, slash, and other wood wastes as by-products of its operations. Combustion of these wastes and of pulping liquors (created in the pulp-making process) supplies two-thirds of the industry's energy needs.

policy priorities. The second two themes, **Secure Energy** and **Energy for the Economy,** carry over from the early 1980s.



Efficient Energy: Cutting energy waste lowers consumer energy bills, benefits the environment, and makes British Columbia industry more competitive.

Clean Energy: Shifting to cleaner fuels and reducing the environmental impacts of energy supply and use will help improve the quality of our air, water, and other natural resources.

Secure Energy: Managing existing resources effectively, finding new sources of supply, increasing fuel choice for consumers, and maintaining the quality and quantity of energy supplies will ensure long-term energy security for the province.

Energy for the Economy: Developing energy resources across British Columbia will stimulate regional growth and bring economic benefits to the province as a whole.

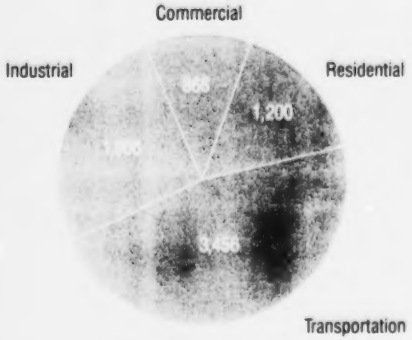
At times, these different economic, environmental, and social goals can be compatible. At other times, tradeoffs must be made. While the resolution of conflicts will be difficult, the four themes described in this document will provide a useful framework to guide energy policy in the decade ahead.

Sustainable development: The building consensus

The United Nations has expressed its "deep concern over the speed and apparent irreversibility with which the planet's environmental resources are being squandered." In 1987, the U.N.'s Brundtland Commission defined sustainable development as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs."

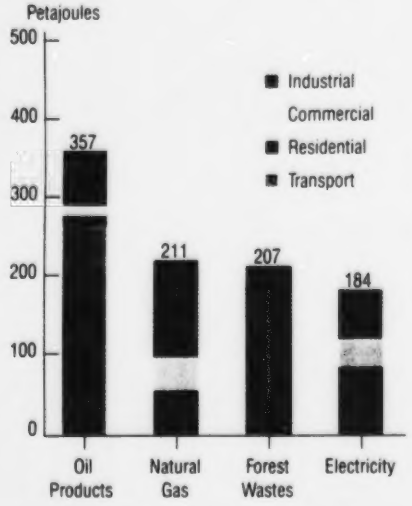
The Canadian Government endorsed the Brundtland Report (*Our Common Future*) and called for the creation of environment/development Round Tables in every province.

In early 1990, British Columbia established a provincial Round Table to advise on how to promote the concept of sustainable development. The permanent 31-member board brings together representatives from industry, business, labour, government, universities, and environmental groups in a common effort. In creating sustainable energy development strategies, we are participating in this provincial and national thrust.



Total: $7,428 million, 1989

Transportation makes up nearly one-half of B.C.'s energy bill



Electricity and natural gas are used throughout B.C.'s economy; oil products and forest wastes have specialized uses

Making the tradeoffs

The 1980 Utilities Commission Act set up a process for major project review which specifically integrates economic and environmental considerations. This ensures that energy projects are in the overall public interest. The procedures examine all relevant environmental, social, and financial costs and benefits of each proposed project.

New energy projects, or major additions to existing ones, require an Energy Project Certificate (EPC). Applications are assessed by all levels of government and the public. For many projects, this means that public hearings will be held. After review, a decision is made on whether to issue an EPC containing terms and conditions that must be followed during project development.

An Energy Removal Certificate (ERC) is required before natural gas or electricity can be removed to markets outside British Columbia. As with projects, these removals must be shown to be in the public interest — thereby determining that the energy is surplus to domestic needs.

A different view of energy

Traditionally when we think of energy, its sources come to mind. The four main types of energy consumed in British Columbia are refined petroleum products (the derivatives of crude oil, such as gasoline), natural gas, electricity, and forest wastes. However, energy is critical not in and of itself, but rather in the services which it provides: lighting, heating, cooling, transportation, motive power, industrial processes, communications, data processing, and so on.

This different view of energy — emphasizing its final services — implies that fuel and power can be used in alternative ways to meet the economy's needs. Increasingly, choices can be made among the types of energy and specific energy technologies, with different implications for cost, efficiency, environmental impact, energy security, and economic benefit. Policies are being developed to help consumers make effective energy decisions during the 1990s.

EFFICIENT ENERGY

A TOP PRIORITY

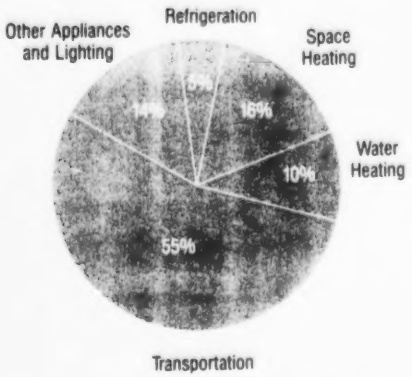
In the late 1980s, energy efficiency emerged as a greater priority in many countries. In North America, this new emphasis has been led by electric utilities in their search for alternatives to large new power plants. Along with other jurisdictions, British Columbia is looking at ways to improve efficiency in all types of energy use.

British Columbia is a heavy consumer of energy. In 1989, the province used 29 percent more energy per capita than Canada as a whole, and at least 50 percent more than many other industrialized economies of the world. The main reason why we use so much energy for our size is the predominance of energy-intensive industry in the provincial economy.

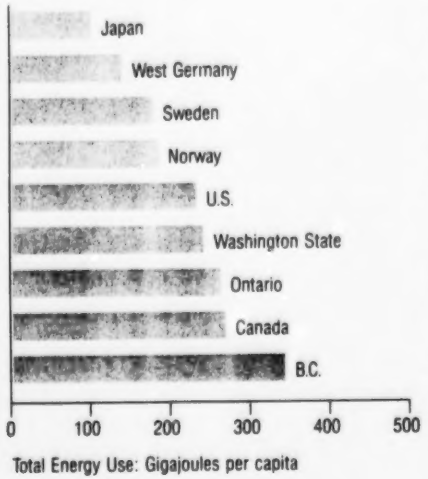
Since 1979, energy use per dollar of output has fallen by some 15 percent in British Columbia. Nevertheless, there is considerable potential to make further improvements in all sectors of the economy. Realizing this potential will require a shared effort on the part of government, industry, business, and individuals to use energy more wisely.

Improving energy efficiency means reducing energy waste. This is important in all areas — in producing energy, in heating and lighting our homes, travelling to work, running

Sign of the times — a model energy efficient house



B.C.'s average household spends $2,400/year on energy; more than half on transportation



B.C.'s economy is among the most energy-intensive

our factories, and recycling and reducing waste materials.

There are two main benefits which follow from the reduction of energy waste:

Economic Benefits: By consuming less energy, individuals can save on their energy bills. Provincial industry can lower costs to help maintain its competitiveness in world markets.

Environmental Benefits: Greater efficiency is the most effective, most comprehensive, and most immediate solution to current energy-related environmental problems. The impacts of energy production and use are directly reduced. Furthermore, the environmental impacts of new energy production facilities can be delayed or, if technological advances allow, avoided altogether.

WHAT THE GOVERNMENT CAN DO

Improving efficiency is a top priority for energy policy in the 1990s. The best energy efficiency improvements are those that consumers make on their own initiative. However, Government can help consumers decide how best to go about cutting energy waste.

Key opportunities for improved energy efficiency in British Columbia occur in areas such as:

PRICING: ensuring that energy prices send the correct signals to consumers about how much and what kinds of energy to use;

STANDARDS: setting minimum energy efficiency levels for products and buildings;

COOPERATION: working with utilities, other agencies, and the private sector to encourage energy efficiency; and

LEADERSHIP: demonstrating and communicating information on energy efficient technologies and behaviours.

B.C.'s energy use: Increasing efficiency

Better building design, more efficient equipment, and improvements in furnaces, vehicles, and electric motors have meant that significant energy efficiency gains have been made over the last decade in all sectors of the B.C. economy.

These efficiency improvements are measured as reductions in energy use per household, per kilometre driven, per unit of output of industrial production, or per dollar of gross domestic product (GDP) for the economy as a whole. Averaged over the whole provincial economy, energy use per dollar of GDP declined by 15 percent between 1979 and 1989.

CURRENT INITIATIVES

Electricity Pricing: In 1989, the B.C. Utilities Commission was directed to help promote efficient energy use by moving B.C. Hydro's electricity rates gradually towards the higher costs of new power supply. Rates are to increase in a stable and predictable manner, while remaining fair and reasonable to consumers.

Standards for Appliances and Other Equipment: British Columbia's Energy Efficiency Act sets minimum efficiency levels for a range of energy-using equipment, from refrigerators to industrial motors. Experience in other North American jurisdictions shows that such standards lead to significant energy savings.

Government Demonstration Projects: Programs to demonstrate and evaluate energy efficient technologies in government buildings and vehicles will be expanded and, where feasible, extended to hospitals, schools, and other public facilities.

Energy Education: A pilot program is being developed with B.C. Hydro to help provincial school children learn about energy and energy efficiency.

EMERGING ISSUES AND INITIATIVES

Energy Pricing: Provincial policy is to let markets determine energy prices as much as possible.

Recognizing the role of markets, there are nevertheless some areas where government can become involved to improve markets and promote energy efficiency. In the 1990s, these include:

OIL: In view of the instability of world oil markets, provincial energy efficiency programs will be closely monitored and adjustments made to maximize their effectiveness.

ELECTRICITY: B.C. Hydro's rate structure will be examined to find ways to encourage more efficient electricity use. (For example, should a customer's power rate fall as consumption increases, as is now generally common?) In addition, provincial policy on hydroelectric water rentals and the B.C. Hydro dividend will be reviewed, as required, to ensure consistency with energy efficiency objectives.

Building Standards: The British Columbia Building Code, to be revised in 1992, will be reviewed for the inclusion of energy efficiency standards on new residential and commercial buildings. Such standards would require cost-effective measures to reduce energy costs and would particularly benefit renters and lower income households unable to afford high energy bills.

Transportation: Energy efficiency in transportation is important not only for economic but also for environmental and energy security reasons. With the goal to improve transportation energy use, the options of provincial fuel efficiency standards and other policy measures will be evaluated.

Utility Programs: The Ministry of Energy, Mines and Petroleum Resources will work with electric and natural gas utilities to develop programs and set targets to ensure that the province's energy efficiency potential is realized. At present, B.C. Hydro and West Kootenay Power both have programs to encourage their customers to use electricity more wisely. In addition, B.C. Hydro has a program to extract additional

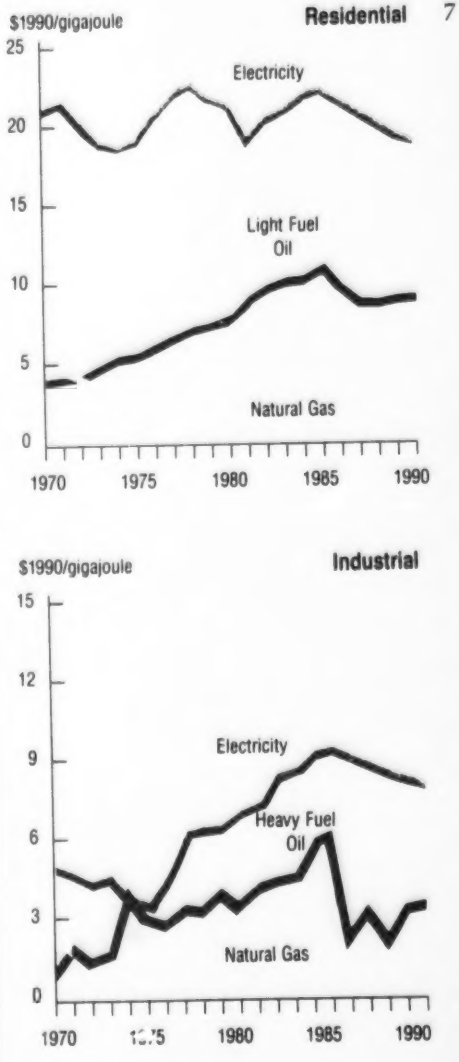
Energy pricing policy

Simply put, energy pricing policy in recent years has sought to make markets more competitive, while protecting consumers, where appropriate, through regulation:

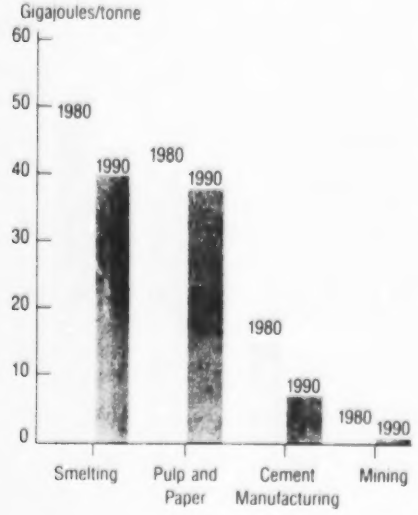
Oil: The pricing of oil products such as gasoline and home heating oil is now determined through competition. These prices depend on what happens in world oil markets and the major oil-producing nations. The lessons learned from the 1970s and early 1980s are that Canada bore a high cost to insulate itself from rising energy prices. Accordingly, as crude oil prices change in response to world events, provincial policy is not to interfere with impacts on retail domestic prices.

Natural Gas: The pricing of natural gas at the point of production (wellhead) is completely deregulated, subject to free negotiation between producers and buyers. However, the cost of delivering natural gas by distribution utilities is regulated. The B.C. Utilities Commission ensures fair rates and long-term security of supply.

Electricity: The pricing of electricity is predominantly regulated, with generation and delivery concentrated in two large utilities. In 1989, the Utilities Commission was directed to raise B.C. Hydro's electricity prices gradually, in keeping with rising new supply costs and the need to promote energy efficiency. At the same time, there are new policy initiatives, such as private power sales and wheeling, to increase competition in the electricity sector. As with natural gas, new large industrial power users are free to negotiate prices with private non-utility generators.



Natural gas remains B.C.'s most competitively-priced fuel



B.C. heavy industry has become more energy efficient in the past 10 years

energy from its existing generation facilities.

Information Programs: Information programs will be developed for individual consumers, architects, builders, developers, landlords, and other groups in order to promote awareness about energy efficiency and understanding of energy efficient technologies.

B.C.'s electric utilities: Leading the way

British Columbia's electric utilities are vigorously pursuing energy efficiency in a number of areas.

B.C. Hydro has:

Power Smart: a package of programs to encourage consumers to use electricity more efficiently, including cash rebates for the purchase of energy efficient appliances and equipment.

Resource Smart: a special initiative to cut waste and produce more power from B.C. Hydro's generating plant and transmission and distribution networks.

West Kootenay Power has:

Power Sense: a series of programs similar to B.C. Hydro's Power Smart, including grants and loans to customers for home weatherization.

Energy efficiency standards: The gathering momentum

In the United States and Canada, governments are setting standards to cut energy waste in new buildings and equipment.

In 1987, the U.S. National Appliance Energy Conservation Act established standards for minimum energy efficiency in 13 classes of major household appliances. The Ontario Energy Efficiency Act, 1988, intended partly to prevent the dumping of inefficient U.S. products, led to provincial standards for a similar range of equipment. Other jurisdictions, such as Quebec and the Canadian Government, are exploring the possibilities of appliance efficiency regulation.

As with appliances, so with buildings. Mandatory energy standards are common in the United States for both homes and commercial structures. Ontario and Alberta have included energy requirements in their residential building codes. Quebec has separate legislation for energy efficiency in the residential and commercial sectors.

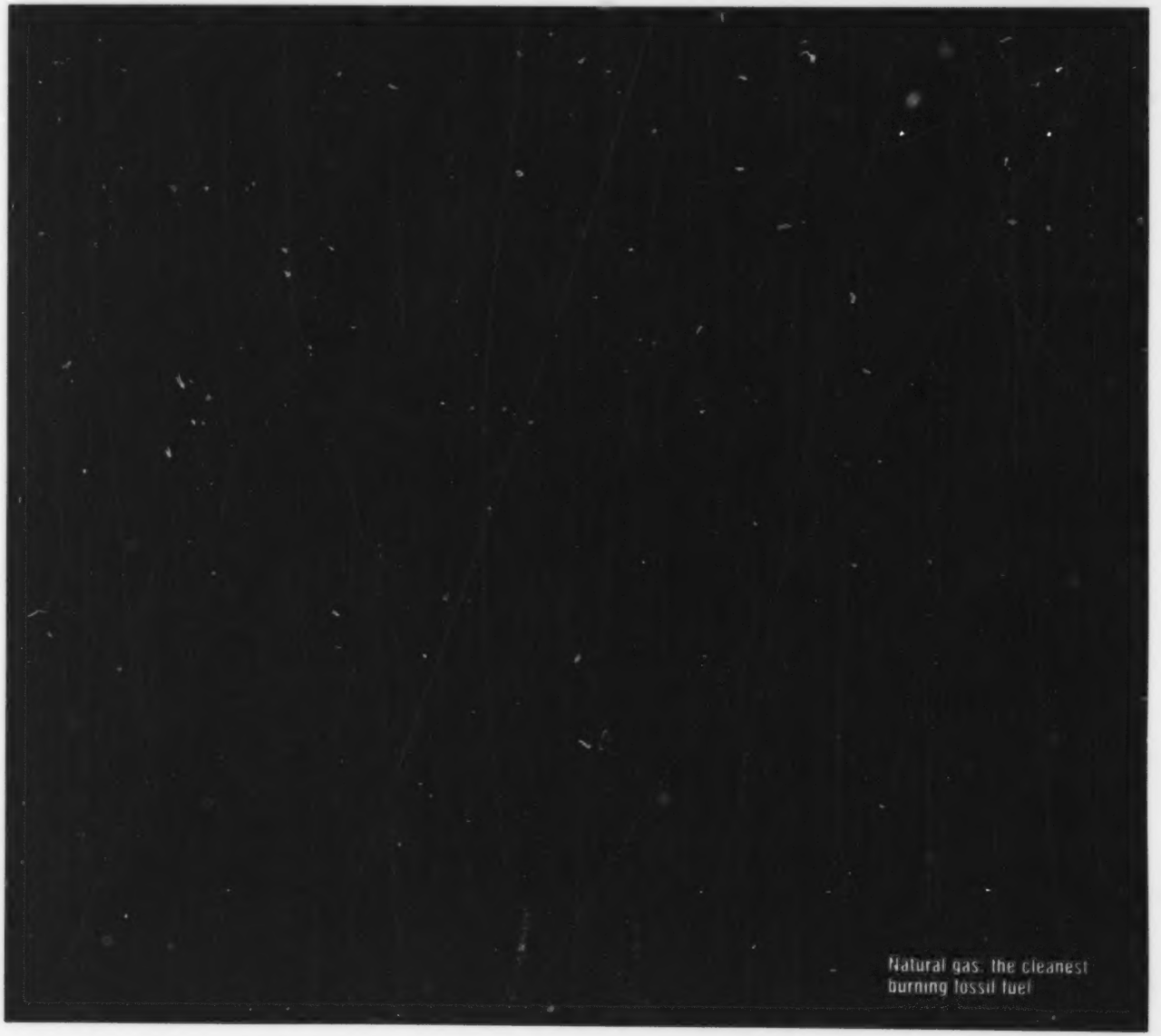
A GROWING CONCERN

During the 1980s, environmental issues climbed to the top of the public agenda. At the same time, there was a growing awareness of the ways in which energy supply and use contribute to total environmental impacts. In British Columbia, where so much energy is used, this contribution is substantial, and the issues correspondingly important.

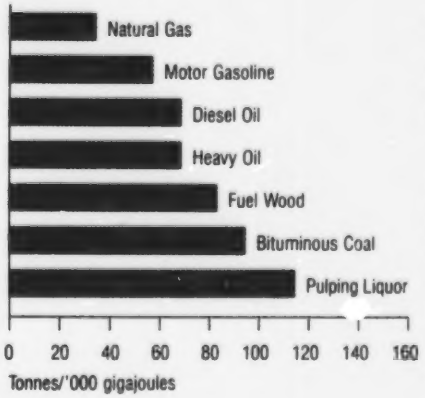
Energy affects the land available for our use, the air we breathe, the purity of our water, and world climate. These impacts, in turn, affect human health and safety and our quality of life. The potential for environmental degradation is present at all stages in the energy lifecycle — from production through transportation, use, and disposal.

Land Use

Land use conflicts arise when one resource activity intrudes on or precludes another land use option. For example, hydroelectric dams can flood wildlife habitat, forests and farmland. Oil and gas development, electric power stations, gas processing plants, and rights-of-way for transmission lines and pipeline corridors may all require the intrusion upon and clearing of large tracts of land.



Natural gas, the cleanest burning fossil fuel



Natural gas produces less carbon dioxide than other fossil fuels

Urban Air Quality

In British Columbia, urban air pollution is mainly the result of burning gasoline and diesel oil in motor vehicle engines. The use of fuel oil by industry is another significant factor. Air quality has become a problem in the Lower Mainland area, where ozone ("photochemical smog"), soot, and other pollutants build up during certain weather conditions. This pollution creates health risks and can lead to crop damage and other economic consequences.

The Global Greenhouse

Carbon dioxide (CO_2) and other gases trap heat in the atmosphere which has been radiated from the earth's surface. Over the past century, atmospheric concentrations of CO_2 have been rising, largely due to the burning of fossil fuels. Many scientists link this buildup to a warming of world temperatures. The magnitude, timing, and regional impacts of global warming are uncertain but could be devastating for many populations.

Acid Rain

Acid rain is caused by the mixing of nitrogen oxides (NO_x) and sulphur dioxide (SO_2) with water vapour in the atmosphere. These emissions come primarily from the combustion of fossil fuels by industry and motor vehicles. Acid rain affects the environment by creating chemical changes in soil and water which, over time, can reduce soil fertility, retard tree growth, and kill fish and plant life.

Did you know. . .?

If unchecked, Vancouver's growing air pollution could reach a scale similar to that of Greater Los Angeles.

Like Los Angeles, Vancouver:

- is located near mountains, which trap air pollutants during temperature inversions; and
- suffers mainly from ozone pollution, popularly known as "smog."

According to research done for the Greater Vancouver Regional District, around 80 percent of the city's air pollution is generated by cars, trucks, and buses. Industry, other transportation, heating, and gasoline marketing account for the remainder.

In the United States and elsewhere, studies have linked this pollution to human health risks — including eye, nose and throat irritation, respiratory problems, aggravation of asthma, and impaired lung function.

Water Pollution

Marine oil spills focus attention on the risks of pollution by oil tanker and barge traffic off the British Columbia coast. Marine pollution is also caused by oily bilge water pumped from tankers and other vessels. However, by far the greatest source of marine pollution is storm-water run-off from land-based sources such as industrial plants and roads. Similarly, inland and groundwater supplies can be harmed by the dumping of oil-based products on the ground, into sewers, or in landfills.

WHAT THE GOVERNMENT CAN DO

Energy resources must be developed and consumed in a way that minimizes adverse impacts on the environment and, where possible, avoids permanent environmental damage. A crucial strategy for reducing energy impacts on the environment in British Columbia is to improve the efficiency of energy supply and use, as outlined above. Further opportunities have been identified in the following areas:

PRICING: ensuring that energy prices send the correct signals about the environmental impacts of energy production and use;

STANDARDS: ensuring that the appropriate environmental standards are set and enforced in energy activities;

COOPERATION: working with other governments, industry, and the public to develop clean energy solutions;

RESEARCH AND DEVELOPMENT: promoting the evaluation and commercialization of cleaner energy technologies; and

LEADERSHIP: demonstrating and communicating information on cleaner energy technologies and their application.

CURRENT INITIATIVES

Vancouver Island Natural Gas Pipeline: With funding assistance from the provincial and federal governments, Pacific Coast Energy Corporation is building a pipeline to bring natural gas to Vancouver Island and Mainland coastal areas. Consumers will be assisted to convert from fuel oil to cleaner-burning natural gas in furnaces and industrial processes.

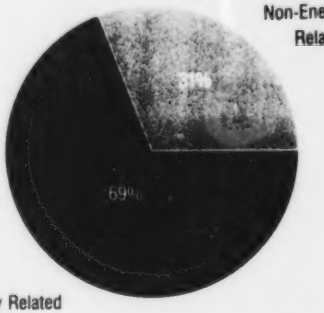
Energy Project Review Process: The process for reviewing major energy projects, which for ten years has integrated economic and environmental assessment with public consultation, will be refined and improved. Recently, the process has been extended to cover many small hydroelectric projects. Private thermal power projects will also be subject to the process. The latter will be required to meet emission standards based on the best pollution control technology that is commercially available. For every new energy facility, siting and project approval will depend on the capacity of the local environment to tolerate further environmental impacts.

Carbon Dioxide Emission Inventory: Recently, the Government completed its first inventory of man-made carbon dioxide emissions in British Columbia. This inventory, which was conducted in conjunction with the National Task Force on Energy and the Environment, will provide the basis for a provincial CO_2 management strategy.

Premiums for Environmental Benefit: B.C. Hydro may offer a higher price ("environmental premium") for electricity purchased from qualifying private power facilities that ease local environmental problems. This policy is being applied on a case by case basis and

Air pollutants: The energy connection

	Principal Source
Ozone (O_3) Pungent, slightly bluish gas. Product of reactive hydrocarbons and nitrogen oxides reacting in sunlight. In upper atmosphere is beneficial and acts as shield against harmful ultraviolet rays.	Motor vehicles
Nitrogen Dioxide (NO_2) Reddish-brown gas. Key component of smog. Formed from nitrogen oxides.	Motor vehicles
Hydrocarbons (HC) and other volatile organic compounds (VOCs) Various organic compounds present in gasoline, diesel and other fossil fuels.	Motor vehicles
Carbon Monoxide (CO) Colourless, odourless, and tasteless gas produced in automobiles.	Motor vehicles
Particulates Small solid or liquid particles suspended in atmosphere. Sometimes visible as smoke or haze.	Motor vehicles
Sulphur Dioxide (SO_2) Pungent, colourless gas. Main component of acid rain.	Industry (burning of oil and coal)



Total Man-Made Emissions: 84 million tonnes, 1988

Most of B.C.'s man-made carbon dioxide emissions are energy-related

may be changed when new environmental standards are introduced.

Interjurisdictional Cooperation: Since environmental problems and their solutions cross provincial and national boundaries, British Columbia is working with other jurisdictions to share information and develop cooperative strategies. Recent joint consultations include: a federal-provincial task force on carbon dioxide emissions, a joint Energy Agreement with Washington State, and an international task force on the safety of marine oil transport.

Carbon dioxide emissions in British Columbia

In April 1990, the Ministry of Energy, Mines and Petroleum Resources published a provincial inventory of carbon dioxide emissions. The study sought to measure man-made CO_2 emissions and "sinks" (natural absorption mechanisms) in an inventory for 1988 and 2005. Key findings included:

- In 1988, most of the man-made CO_2 emissions were related to energy use, followed by the burning of slash and wood waste in the forestry sector.
- The industrial sector, dominated by forest products, accounted for 50 percent of energy-related emissions, while road vehicles contributed 19 percent.
- The worst fuels for producing energy-related carbon dioxide were refined petroleum products (primarily gasoline and diesel oil), pulping liquors, and wood waste.

EMERGING ISSUES AND INITIATIVES

Greenhouse Gas Management Strategy: In consultation with the public, industry, and other groups, the Government will develop a strategy to reduce carbon dioxide and other greenhouse gas emissions. This strategy will emphasize efficiency in energy and other resource (e.g., forestry) use, as well as a switch to cleaner fuels.

Demonstration: Provincial funding will be provided to demonstrate the applicability of hydrogen fuel cell technology in the transportation sector. The use of hydrogen and other alternative transportation fuels can help control greenhouse gas emissions and urban smog on the Lower Mainland.

Environmental Costing: The environmental impacts of energy development and use will be analyzed to ensure that environmental costs are incorporated in energy decisions.

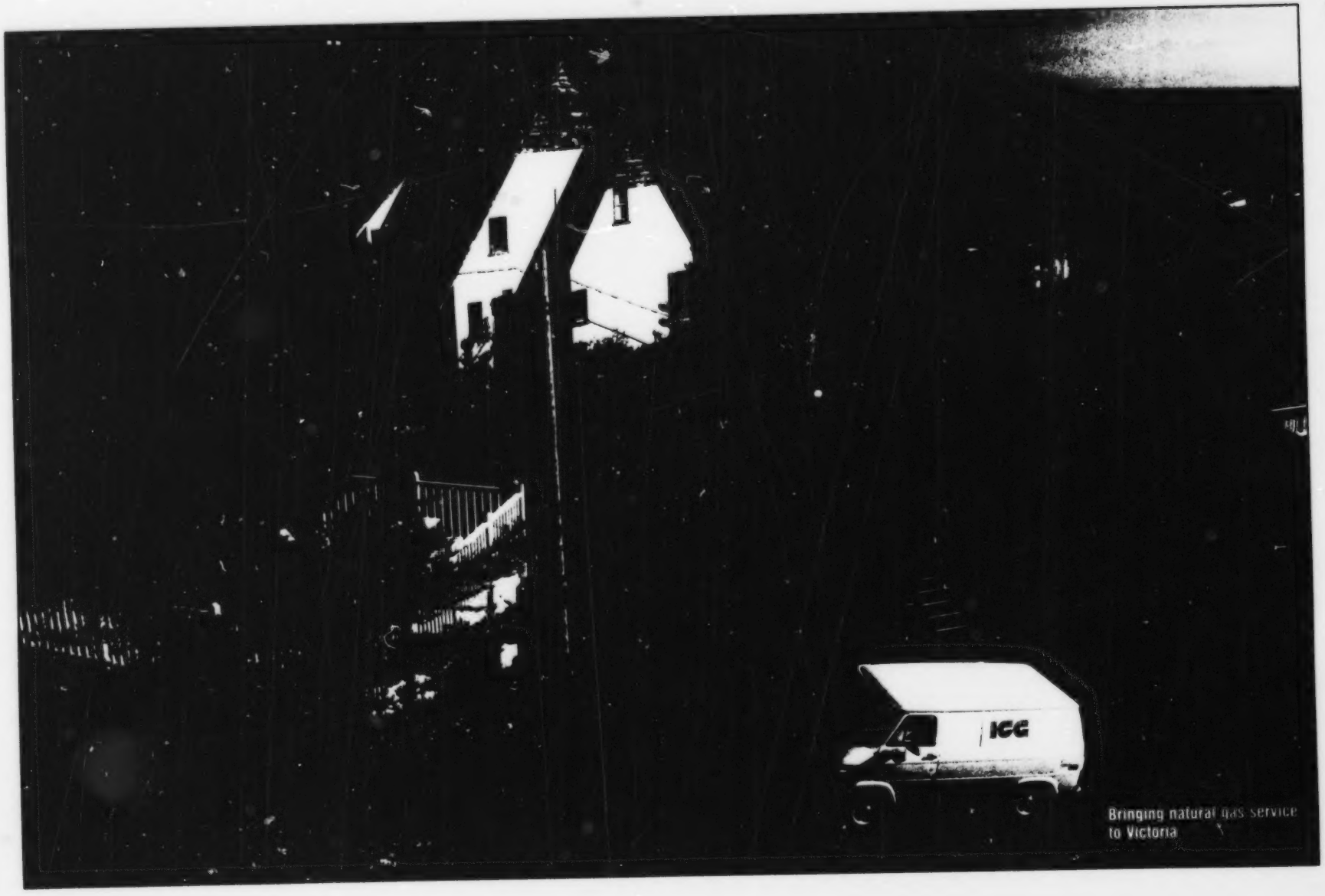
Facts on the Vancouver Island gas pipeline

In December 1989, construction started on the pipeline to bring natural gas service to Howe Sound, the Sunshine Coast, and Vancouver Island. Natural gas will start flowing to Vancouver Island by the summer of 1991.

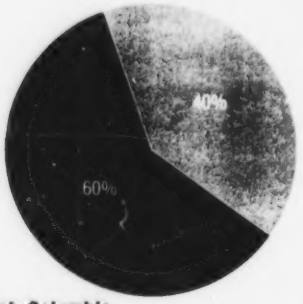
Currently, more than 50,000 customers on the Island and Sunshine Coast use oil to meet their heating needs. The largest of these customers are seven pulp mills which now burn heavy fuel oil. Switching to natural gas will lead to a significant decline in the acid rain-causing sulphur emissions on B.C.'s South Coast. In addition, there will be reduced oil barge traffic between the Mainland and Vancouver Island.

Clean Energy: Financial assistance will be considered, project by project, for feasibility studies into cleaner energy technologies.

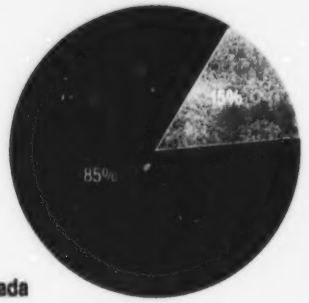
Recycled Oil: The Government is increasing its own contribution to clean energy. The existing program to use recycled oil in a portion of the government vehicle fleet will be extended to other public vehicles.



Bringing natural gas service to Victoria



British Columbia



Canada

■ Renewable Energy
■ Nonrenewable Energy

B.C.'s use of renewable energy, including hydroelectricity, is more than twice the national average

Putting waste to work

Waste is already an important energy source in British Columbia. Currently, the chief forms of waste used to generate energy are pulping liquors (spent liquids from pulp and paper manufacture) and wood waste (slash, bark, chips, etc.), both produced by the forest products industry. In 1990, the use of these wastes accounted for 20 percent of total provincial energy consumption.

Energy can be generated from:

Wood Waste: Over 100 "beehive" burners handle around 30 million cubic metres of sawmill waste annually in the province. Incineration to produce energy would burn the waste more completely and reduce local air pollution. This waste constitutes a potential power resource similar in scale to a major new hydroelectric dam.

Garbage: Non-recyclable garbage can also be burned to generate energy, while reducing landfill requirements. However, garbage-burning facilities are expensive and raise difficult environmental problems. As a result, energy from garbage is not expected to contribute significantly to energy supply in the 1990s.

Cleaner fuels for the future

Both urban air pollutants and greenhouse gas emissions can be substantially reduced by substituting alternative transportation fuels for gasoline and diesel oil. In British Columbia, the most promising candidates are:

Hydrogen vehicles

- almost no emissions from the vehicle itself
- large technology potential in fuel cells, which operate like constantly-charged batteries
- technology is advancing with significant B.C. leadership

Natural gas vehicles (NGV)

- potential for lower emissions of all pollutants in natural gas-optimized engines
- refuelling capacity is expanding quickly
- well-suited to buses, light trucks, and fleet vehicles
- over 9,500 vehicles converted to date in B.C.

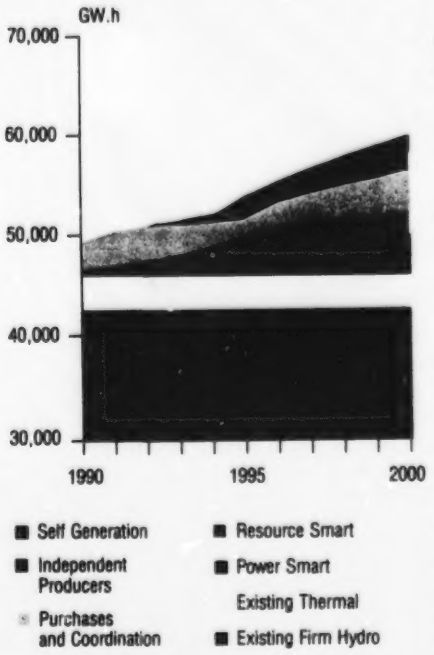
A CONTINUING THEME

The assurance of adequate supplies of reliable energy became a central concern with the oil price shocks of 1973 and 1978. After receding from public awareness during the 1980s, the energy security issue abruptly returned to centre stage in the summer of 1990 with renewed instability in the Persian Gulf.

A stable and diverse supply of energy is critical to the functioning of any dynamic modern economy. British Columbia's reserves of water power, natural gas, coal, and wood wastes are substantial. However, the province imports about 80 percent of its oil requirements, principally from Alberta. Since provincial oil reserves are declining, we will rely increasingly on out-of-province supplies to meet our petroleum needs.

Industrial and municipal wastes, essentially "renewable," are a large potential source of energy in British Columbia. Other energy forms such as geothermal, solar, wind, and tidal power are less cost-effective and have not been developed extensively to date. However, these alternative energy sources could become more important in the future, particularly in remote locations of the province where energy costs are comparatively high.

Construction of the Vancouver Island natural gas pipeline



B.C. Hydro's *Resource Plan 1900-2000* shows a new mix of power sources

Energy security in the 1990s will have three main aspects:

- policies to encourage energy reserves and development activity are necessary to ensure that reliable supplies are available for the domestic market;
- fuel choices available for consumers should be broadened (e.g., by extending natural gas and electricity service) to reduce vulnerability to oil supply disruptions; and
- alternative forms of energy should be developed to expand the province's portfolio of resource options.

WHAT THE GOVERNMENT CAN DO

Reliable supplies of energy must be guaranteed over the long term, and the development of British Columbia's energy resources must be carefully managed. The Government's encouragement and guidance will help the private sector become more involved in developing resources and supplying energy consumers during the 1990s.

To maintain energy security in British Columbia in the coming decade, policy initiatives will address the following areas:

PRICING: ensuring an attractive investment climate for the energy industry to promote continued development and supply;

REGULATORY FRAMEWORK: maintaining and improving the province's regulatory procedures for the review of domestic supplies and exports; and

NEW SOURCES OF ENERGY: encouraging the development of new conventional and alternative sources of energy.

What are reserves?

Reserves are estimated quantities of recoverable, non-renewable energy resources. These quantities may change over time. Reserves continually decrease with ongoing energy production. They increase as:

(1) new resource deposits are discovered; (2) production technologies improve so that lower quality resources become technically recoverable; and (3) energy prices rise to make higher cost resources economically recoverable.

These forces tend towards balance. A rise in energy prices will tend to stimulate exploration and discovery, encourage improvements in recovery technology, and make a wider range of resources economically accessible.

Reserves are often measured by the number of years of life remaining at current levels of production. At present in British Columbia, established domestic reserves are estimated at:

Crude Oil	10 years
Natural Gas	20 years
Coal	500+ years

Undiscovered natural gas potential represents an additional 50 years of supply. Enhanced oil recovery techniques could double oil reserves.

CURRENT INITIATIVES

Core Market Policy: Residential, commercial, and small industrial users of natural gas in British Columbia are guaranteed secure supplies at reasonable prices. This "core market" policy ensures a continuing long-term supply of natural gas for provincial customers.

Energy Removals: The requirements for issuing Energy Removal Certificates will continue to ensure that removals consist only of electricity and natural gas which is not needed in the province. The approval process for long-term natural gas removals was made more flexible in 1990.

Cogeneration: Cogeneration of electric power and usable heat by industry and institutions is being encouraged through B.C. Hydro initiatives. Cogeneration helps to diversify the province's power supply and reduces the need for large new generating stations and long-distance transmission.

Cogeneration: The new opportunities

In practice, cogeneration means using the same heat source not only for industrial processes and space heating, but also to generate electricity. Cogeneration is advantageous in industries with large heat loads, and in large institutional buildings such as hospitals that use steam or hot water for space heating. Cogenerators are able to save on their total energy bills and earn revenue by selling surplus power back to the electric utility.

Cogeneration is becoming increasingly attractive to pulp and paper producers, who can dispose of their wood waste at the same time. B.C. Hydro is now offering to buy cogenerated electricity at prices approaching the cost of new utility resources. With this encouragement, cogeneration capacity in the forest sector alone could double.

Power Coordination: B.C. Hydro is coordinating its power system with those of neighbouring jurisdictions. Pooling of resources in this manner will improve operating efficiencies and allow the deferral of new plant construction.

EMERGING ISSUES AND INITIATIVES

Market Information: Monthly statistics on all natural gas sales will be published by the Ministry of Energy, Mines and Petroleum Resources, to improve the quality of information available to gas sellers and buyers. This initiative should help overcome any remaining barriers to free market operation following the deregulation of natural gas supply in British Columbia.

Energy Pricing: The profitability of the energy sector will be continually evaluated to see whether measures are necessary to maintain private investment. The province's royalty and taxation regime must be conducive to energy development, while also providing a fair share of resource revenue to the people of British Columbia.

Columbia River Downstream Benefits: Starting in 1998, power from the Columbia River previously sold under long-term contract to the United States will be repatriated. This "new" source of electricity, which takes advantage of existing generation facilities, is clean and inexpensive compared to other provincial generation options.

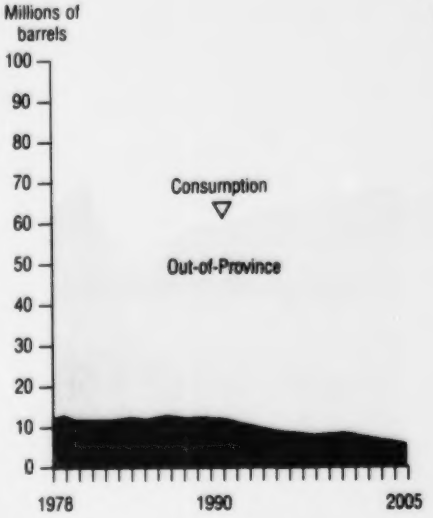
Electricity Planning: B.C. Hydro will bring potential projects to an advanced state of planning. This policy will reduce the lead times of major projects such as hydroelectric dams, in the event that new resources are needed sooner than expected.

Geothermal resources: Energy from the earth

Geothermal technologies recover the earth's own energy — underground pockets of hot water and steam — to generate electricity and serve space heating needs. These technologies have been used successfully in Iceland, Italy, New Zealand, and California. At present world-wide, there are over 5000 MW of geothermal power capacity spread over many small plants.

Canada's geothermal potential is concentrated in British Columbia. B.C. Hydro has been studying commercial applications, focussing on the Meager Creek area of the Coastal Range near Pemberton. The Ministry of Energy, Mines and Petroleum Resources is also continuing its efforts with Energy, Mines and Resources Canada to map geothermal resources.

The main constraints on commercialization are high capital costs and the long distances between sites and demand centres. Nevertheless, geothermal energy can offer environmental benefits and the opportunity to diversify energy sources.



B.C. will continue to depend on out-of-province oil supplies

Enhanced Oil Recovery: Policies will be developed to increase oil recovery from established conventional reservoirs. The goal will be to maximize recovery of British Columbia's petroleum resources in view of the continuing importance of oil as an energy source and the high degree of reliance on imported supplies.

Bringing back Columbia River power

Under the Columbia River Treaty, three B.C. dams — Duncan, Keenleyside, and Mica — were built for power generation and flood control downstream in the United States. Although the resulting additional generation occurred at U.S. facilities, B.C. was entitled to half of these "Downstream Benefits" or DSBs. In the 1960s, however, we did not need the added energy and so sold our entitlement to American buyers for 30 years.

Starting in 1998, the United States will return the DSBs to the province free of charge at the Canadian border. At their peak, the benefits could be roughly equivalent in size to the Peace Site C hydroelectric project. Because they come from existing facilities, the Columbia River DSBs are both inexpensive and clean compared to new generating facilities. Government will determine how this resource can best be used to benefit British Columbians.

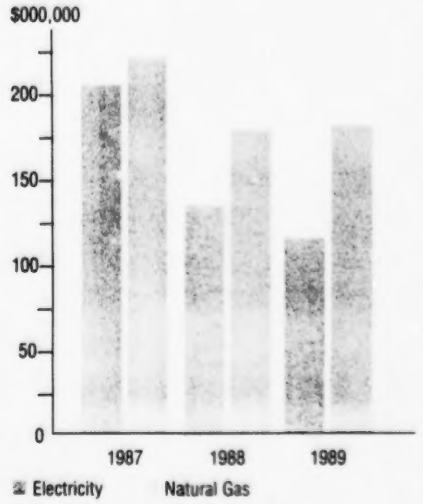
A PROVINCIAL BENEFIT

British Columbia's abundance of reasonably priced energy resources has provided a foundation for provincial economic growth. These resources have helped to make our industry more competitive in world markets and to improve our standard of living and lifestyle. In the future, energy will continue to be a key contributor to the prosperity of all British Columbians.

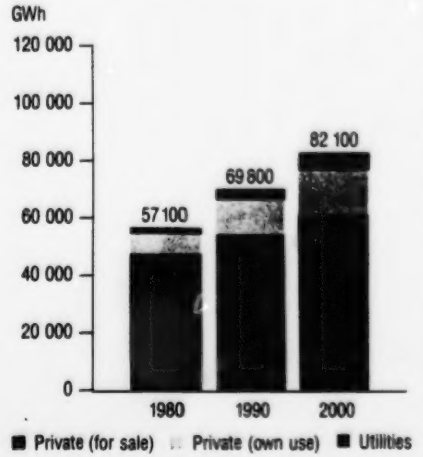
Access to abundant energy has been a key factor in attracting to British Columbia energy-intensive resource-based industries such as mining, smelting, petrochemicals, and pulp and paper. Accordingly, energy development contributes to employment not only in the energy sector itself but also much more substantially in industry. Local energy supplies have helped to support regional economic growth across the province.

In 1989, the value of energy sales in British Columbia totalled $7.4 billion, while government revenues from energy totalled $1.2 billion. Direct energy exports amounted to $1.9 billion dollars; however, energy is also exported in energy-intensive goods including aluminum, pulp and paper, lead, and zinc.

B.C. Hydro's Mica Dam on the Columbia River



Natural gas and electricity are an important source of export revenue



The future will see a larger role for private power producers

WHAT THE GOVERNMENT CAN DO

Energy resources must continue to be managed to encourage economic growth, employment, regional development, industry and government revenues, and exports. Economic opportunities can arise from government initiatives in the following areas:

PRICING: ensuring that energy is priced competitively;

PRIVATE ENTERPRISE: expanding private sector business opportunities in the energy industry; and

EXPORTS: monitoring the export of energy to guarantee that domestic needs are met.

CURRENT INITIATIVES

Energy Pricing: Through a number of policies such as deregulation and electricity rate-setting and restructuring, the Government continues to ensure that energy is priced competitively and fairly to benefit all British Columbians. While the current policy is to raise B.C. Hydro's rates gradually to encourage more efficient use, these rate increases must also consider the impacts on consumers and industrial competitiveness.

Natural Gas Deregulation: The marketing functions previously held by the British Columbia Petroleum Corporation (BCPC) have been transferred to the private sector, to encourage more aggressive marketing of natural gas domestically and abroad. This initiative is part of a continuing policy trend towards increased competition in the supply of natural gas in British Columbia.

Private power: New players in the marketplace

Traditionally, the supply of electric power to provincial consumers has been concentrated in monopolies like B.C. Hydro. These monopolies arose, in large part, to take advantage of the economies of scale in hydroelectric development. In Canada, government-owned utilities have used electricity supply as a tool for economic development.

Recently, however, there has been interest in a greater role for the private sector in British Columbia's electricity future. B.C. Hydro is looking to private power purchases as one of its key resource options for the 1990s and beyond. B.C. Hydro has issued several calls for private generation projects to serve the domestic and export markets. Current proposals cover a variety of generation sources — natural gas, wood waste, cogeneration, hydroelectric, geothermal, and coal and waste coal. B.C. Hydro is now negotiating its first round of private power purchases, with the intention of seeking further purchases annually.

Power Wheeling: A draft policy has been filed with the B.C. Utilities Commission to make B.C. Hydro's transmission facilities available to outside suppliers, so that industrial customers can buy directly from private power producers when it is cost-effective to do so. This use of the province's power network — a function known as "wheeling" — will be supported through transmission rates and service conditions to be announced by the Government and B.C. Hydro.

Private Power Production: B.C. Hydro is purchasing electricity from private generators to supply the domestic market. Among the benefits of this initiative is the potential for regional economic development and the opportunity for resource-based industries to locate near private power sites in the future.

Interruptible Power Pool: B.C. Hydro is also creating a power pool to specialize in the purchase and sale of lower cost, "interruptible" electricity (power subject to unscheduled interruptions in its supply). This power pool will create business opportunities for private power producers and other electricity

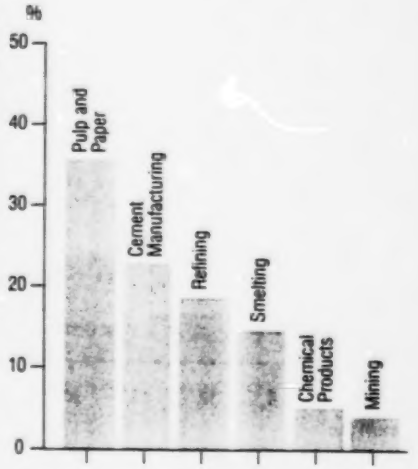
suppliers wishing to sell into the interruptible market.

Firm Power Exports: The role of B.C. Hydro's export subsidiary, POWEREX, is to facilitate long-term firm electricity exports, provided that:

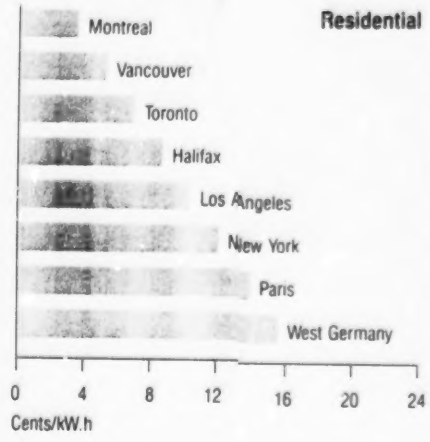
- electricity is sold from private generation facilities built for the export market, with all risk borne by the private sector;
- sales are for a limited term, after which export facilities are "recaptured" for domestic use; and
- exports are priced to cover their full costs, including environmental and social costs, by a significant margin.

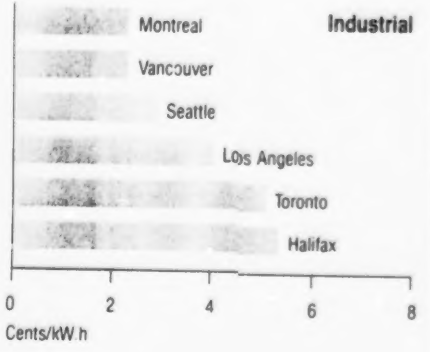
The approval of thermal power projects for export under the Energy Project Review Process will depend on emission limits and the status of local airsheds, and will require that strict pollution control standards be met.

Natural Gas Exports: Through deregulation initiatives, exports of natural gas are being encouraged to take full advantage of the province's production and transmission facilities. British Columbia's large gas reserves and existing pipeline infrastructure provide a favourable environment for increased sales to Eastern Canada and the United States.



Purchased energy is a large share of industry's total cost





B.C.'s electricity prices are among the lowest in the world

Petrochemical Industry: Further development of British Columbia's petrochemical industry is under review. Increased petrochemical production, by extending the processing of energy resources, adds to the province's employment and economic diversity.

Energy and provincial revenues

Over $1 out of every $10 collected by the provincial Treasury comes from energy. This revenue supports government spending programs to the benefit of all British Columbians.

Water rentals are charged on the generation of hydroelectric power. B.C. Hydro also pays a dividend to the province from its surplus revenues. Royalties and land payments are collected from oil and natural gas producers. Coal producers pay royalties and other taxes.

Energy producers and distributors pay corporate income tax. Energy consumers pay fuel taxes and social services tax on some energy products. In 1989/90, direct energy revenues totalled about $1.2 billion:

Water rentals	$225 million
B.C. Hydro dividend	100
Oil and gas royalties and fees	230
Coal royalties and taxes	25
Corporate Income Tax	20
Fuel Tax	500
Social Services Tax	115
Total	$1.2 billion

EMERGING ISSUES AND INITIATIVES

Load Displacement: In conjunction with its private power and wheeling initiatives, on a case by case basis, B.C. Hydro may be willing to shed existing industrial load, where industrial customers wish to buy directly from private power producers and B.C. Hydro will not sustain a revenue loss. This action will provide cost savings to industry and will allow B.C. Hydro to postpone new generating capacity.

Export Benefits: Energy exports will continue to be encouraged as a source of economic benefit for both the private sector and British Columbians as a whole. All export sales are scrutinized under the province's Energy Removal Certificate process to determine that they are in the public interest. Where exports involve the construction of new energy production, transmission, or processing facilities, they will be subject to the Energy Project Review Process to ensure that they are environmentally sound.

Provincial Revenues: The province's system of energy royalties, rentals, and taxes will be monitored to see that British Columbians continue to receive their fair share of revenue as owners of the resources. For example, B.C. Hydro now pays a provincial dividend to reflect the equity position of the people of British Columbia as shareholders. In natural gas, the Government will institute a minimum price for royalty purposes, to protect its revenue share.

Deregulation of natural gas

In 1985, the Governments of Canada and the gas-producing provinces (Alberta, Saskatchewan and British Columbia) signed the Agreement on Natural Gas Markets and Prices. This Agreement shifted the focus away from regulation and towards increased reliance on market forces, thus ending a decade of price and export controls. It paved the way for direct purchases and negotiation of prices between buyers and sellers of natural gas.

Since the mid-1980s, the process of deregulation has continued with several government initiatives. Today, large industrial gas users are free to arrange their own cost-effective purchases. Greater competition is resulting in lower prices in a number of regional markets.

GLOSSARY

Cleaner fuels/technologies: Fuels or energy technologies that result in relatively less pollution.

Energy-intensive: Characterizes an activity, technology, etc., that uses a relatively large amount of energy to produce a given product or service.

Energy efficient technologies: Equipment such as furnaces, industrial motors, and household appliances designed to use energy more efficiently.

Energy Removal Certificate: Provincial permit issued for the production and transportation of natural gas or electricity to the B.C. border for delivery outside the province.

Home weatherization: Energy efficiency measures such as insulation, caulking and weatherstripping, and window and door improvements designed to tighten the energy integrity of the home and reduce heat loss.

Hydro dividend: A payment from B.C. Hydro to the Government in return for the equity position of the people of British Columbia in the Crown utility.

Load displacement: Measures undertaken by an electric or natural gas utility to shed customers or otherwise reduce demand and, therefore, possibly defer the need to install new energy production or delivery facilities.

Minimum energy efficiency standards: Standards specifying energy efficiency requirements (e.g., maximum energy consumption levels) for energy-using equipment such as furnaces, lighting, and household appliances.

Royalty: A payment to the Government in return for the right to produce Crown-owned resources such as oil or natural gas.

Water rental: A payment to the Government for the use of water resources by producers of hydroelectric power.

ENERGY UNITS

1 gigajoule (GJ)
= 278 kilowatt-hours (kW.h)
= 0.16 barrels of oil
= 915 cubic feet of natural gas
= 29 litres of gasoline
= 940,000 British Thermal Units (Btus)

- The average B.C. household uses about 200 GJ each year for heat, light, hot water, and gasoline.
- 1 GJ will
  - light your house for three months
  - give you hot water for three weeks
  - power your car for 150 miles.

1 petajoule (PJ)
= 1 million gigajoules
= 278 gigawatt-hours (GW.h)
= 163,500 barrels of oil
= 915 million cubic feet of natural gas
= 940 billion Btus

- The City of Vancouver uses about 1 PJ of energy every day.
- B.C. exported over 150 PJ of natural gas to the U.S. in 1989.
- B.C. refineries produce 130 PJ of gasoline per year.

Photographs courtesy of B.C. Hydro, BC Gas and Westcoast Energy.

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